

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

Claims 1-20 (Canceled).

21. (New) A surface treating method for treating a surface of a member, comprising:

producing a cluster having a first molecule and a second molecule bonded together by an intermolecular force in a gas vapor phase, making the first molecule more reactive than the first molecule in a case of being not bonded with the second molecule by utilizing at least a part of internal energy released in producing the cluster; and

treating the surface of the member in a gas phase with the cluster containing the first molecule made in a state of higher reactivity, wherein:

an electromagnetic field irradiates the cluster containing the first molecule made in the state of higher reactivity.

22. (New) The surface treating method according to claim 21, wherein the energy of the electromagnetic field is 0.4 eV or more.

23. (New) A surface treating method for treating a surface of a member, comprising:

producing a cluster having a first molecule and a second molecule bonded together by an intermolecular force in a gas vapor phase, making the first molecule more reactive than the first molecule in a case of being not bonded with the second molecule by utilizing at least a part of internal energy released in producing the cluster; and

treating the surface of the member in a gas phase with the cluster containing the first molecule made in a state of higher reactivity, wherein:

a position making the first molecule higher in reactivity is near the surface of the member.

24. (New) A surface treating method for treating a surface of a member, comprising:

producing a cluster having a first molecule and a second molecule bonded together by an intermolecular force in a gas vapor phase, making the first molecule more reactive than the first molecule in a case of being not bonded with the second molecule by utilizing at least a part of internal energy released in producing the cluster; and

treating the surface of the member in a gas phase with the cluster containing the first molecule made in a state of higher reactivity, wherein:

the first and the second molecules are supplied to the surface of the member as a gas, which contains the first molecule, and a gas, which contains the second molecule, or as a mixed gas, which contains both the first and the second molecules, and a microwave is applied to at least one of the gas which contains the first molecule, the gas which contains the second molecule, and the mixed gas which contains both the first and the second molecules.

25. (New) The surface treating method according to claim 24, wherein the frequency of the microwave is 3 GHz or more.

26. (New) The surface treating method according to claim 24, wherein at least one of the gas which contains the first molecule, the gas which contains the second molecule, and the mixed gas which contains both the first and the second molecules, is a gas consisting of molecules having vibrational degrees of freedom of 60 or less.

27. (New) A surface treating method for treating a surface of a member, comprising:

producing a cluster having a first molecule and a second molecule bonded together by an intermolecular force in a gas vapor phase, making the first molecule more reactive than the first molecule in a case of being not bonded with the second molecule by utilizing at least a part of internal energy released in producing the cluster; and

treating the surface of the member in a gas phase with the cluster containing the first molecule made in a state of higher reactivity, wherein:

the treating of the surface of the member with the cluster includes oxidizing the surface of the member or contamination that is adhered to the surface of the member, the method further comprising:

treating the surface of the member using any of a gas having reactivity with an oxide, or a chelating agent forming a chelate compound with metals, which are adhered to the surface of the member, after or together with treating the surface of the member with the cluster.

28. (New) A surface treating method for treating a surface of a member, comprising:

producing a cluster having a first molecule and a second molecule bonded together by an intermolecular force in a gas vapor phase, making the first molecule more reactive than the first molecule in a case of being not bonded with the second molecule by utilizing at least a part of internal energy released in producing the cluster;

treating the surface of the member in a gas phase with the cluster containing the first molecule made in a state of higher reactivity; and

physically removing a residual product produced on the surface of the member by treating the surface of the member with the cluster.

29. (New) A surface treating method for treating a surface of a member;
comprising:

producing a cluster having a first molecule and a second molecule bonded together by an intermolecular force in a gas vapor phase, making the first molecule more reactive than the first molecule in a case of being not bonded with the second molecule by utilizing at least a part of internal energy released in producing the cluster;
and

treating the surface of the member in a gas phase with the cluster containing the first molecule made in a state of higher reactivity, wherein:

the member is a semiconductor substrate and treating the surface of the semiconductor substrate with the cluster is at least one step selected from a group consisting of a step of cleaning the surface of the semiconductor substrate, a step of forming an oxide film, which contains silicon, on the surface of the semiconductor substrate, a step of forming an oxide film, which contains metals, on the surface of the semiconductor substrate, a step of oxidizing a film on the surface of the semiconductor substrate, a step of forming a film by a chemical vapor phase deposition on the surface of the semiconductor substrate, a step of forming a film by a physical vapor phase deposition on the surface of the semiconductor substrate, a step of thermal treatment of the surface of the semiconductor substrate and a step of dry etching of the surface of the semiconductor substrate.